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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,011	03/04/2002	Ismail Kashkoush	108430.030	6683
26316	7590	02/12/2004	EXAMINER	
COZEN AND O'CONNOR 1900 MARKET STREET PHILADELPHIA, PA 19103			KORNAKOV, MICHAEL	
			ART UNIT	PAPER NUMBER
			1746	

DATE MAILED: 02/12/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/091,011	KASHKOUSH ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Michael Kornakov	1746	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 04 March 2002.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-15 is/are pending in the application.
- 4a) Of the above claim(s) 10-15 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☒ Claim(s) 1-15 are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 04 March 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |                                                                                         |                                                                             |
|-----------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)             | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)    | Paper No(s)/Mail Date. _____                                                |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____                                                             | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### *Election/Restrictions*

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
  - I. Claims 1-9, drawn to a method of cleaning semiconductor wafers, classified in class 134, subclass 28.
  - II. Claims 10-15, drawn to apparatus for pre-epitaxial cleaning, classified in class 134, subclass 102.1.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions of Group I and Group II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the claimed method can be practiced in centrifuge apparatus, equipped with nozzle system for spraying the processing liquids to wafer surface, and rotatable wafer support for the removal of processing liquid from wafer surface directly to the drain due to centrifuge force, which is materially different from the apparatus with outer weir for directing cascading liquids, as instantly claimed.
3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

5. A telephone call was made to Mr. M. Fein, esq., on 02/03/04 to request an oral election to the above restriction requirement, but did not result in an election being made.

Applicant is advised that the reply to this requirement to be complete must include an election of the invention to be examined even though the requirement be traversed (37 CFR 1.143).

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

### ***Drawings***

7. Figure 1 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g). As instantly presented, Fig. 1 is designated by a label "Comparative", however, page 4, line 20 of the instant disclosure recites "prior art". Applicants are encouraged to designate the legend ---Prior Art--- to any old information shown on drawings. A proposed drawing correction or corrected

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drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

### ***Specification***

8. The disclosure is objected to because it is not clear and there is no guidance what the recited on page 4, lines 15-17 terms, such as the dissolved oxygen (DO<sub>2</sub>), the total organic carbon (TOC) and the total dissolved silica are related to.

9. The disclosure is objected to because of the following informalities: paragraph, bridging pages 4 and 5 duplicates the recitation of drawings 6-10.

Appropriate correction is required.

### ***Claim Objections***

10. Claim 1 is objected to because of the following informalities:

- Line 4 of claim 1 recites "etching silicon wafers with HF". Apparently, etching silicon wafers with HF solution is indicated.
- Line 6 of claim 1 recites "dilute HF". Apparently dilute HF solution is indicated.

### ***Claim Rejections - 35 USC § 112***

11. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

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12. Claims 7, 8 and 9 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claims 7,8 and 9 recite the limitations, such as the dissolved oxygen (DO<sub>2</sub>), the total organic carbon (TOC) and the total dissolved silica. However, the instant specification fails to describe what these limitations are related to and, therefore, the skilled artisan would not be able to use the invention commensurate in scope with these claims.

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 7, 8 and 9 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

- Claim 7 recites the limitation "the dissolved oxygen" in line 19. There is insufficient antecedent basis for this limitation in the claim.
- Claim 8 recites the limitation "the total organic carbon" in line 21. There is insufficient antecedent basis for this limitation in the claim.
- Claim 9 recites the limitation "the total dissolved silica" in line 22. There is insufficient antecedent basis for this limitation in the claim.

***Claim Rejections - 35 USC § 103***

14. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

15. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

16. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

17. Claims 1-3, 5-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Verhaverbeke et al (US 2002/0102852) in view of Patruno et al (In-situ Rinse HF-Last for Pre-Epitaxy Cleaning, UCPSS, 1994, pp. 247-250).

Verhaverbeke et al. teach a method of cleaning semiconductor wafers, followed by further processing, wherein the wafers comprise monocrystalline silicon substrate (paragraph 0037). The method of Verhaverbeke et al includes the steps of etching semiconductor wafers with 2% solution of HF to strip an oxide surface of the wafer (paragraph 0053); rinsing the etched wafers with ozonated DI water, which includes between 2ppm and 20 ppm of ozone (paragraphs 0054, 0056); treating the rinsed wafers with solution comprising ammonium hydroxide, hydrogen peroxide and water (reads on "dilute SC1", as instantly claimed), thus forming native oxide (paragraph 0060, paragraph 0037); rinsing the wafers with DI water (paragraph 0063); drying the wafers with nitrogen and IPA (paragraph 0064), wherein all the recited steps are performed in the same processing chamber.

The teaching of Verhaverbeke et al remains silent about the step of additional treating of wafers with dilute HF, followed by rinsing before drying the wafers.

Patruno et al. teach the final cleaning step, which is utilized after the wafer was treated with various cleaning liquids, but before drying, and which provides hydrogen passivated wafer surfaces and facilitates final removal of metal residues, still present on such surfaces. The final cleaning step of Patruno et al. includes treating the wafers with extremely diluted solution of HF, followed by displacing of HF diluted solution with DI water. Patruno et al. also provides for the after clean processing, such as epitaxy, and indicates that before epitaxy being done a complete oxide removal and native oxide formation with SC1 solution is performed (pages 247, 249, 250).



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Because both Verhaverbeke et al. and Patruno et al. are concerned with cleaning of semiconductor wafers and Patruno et al. teach a specific final step in order to facilitate removal of metal residues and form hydrophobic wafer surface in a cleaning procedure, which includes complete oxide removal and native oxide formation with SC1 solution, one skilled in the art motivated by the teaching of Patruno et al. would have found it obvious to utilize a final cleaning step of Patruno et al. in the method of Verhaverbeke et al in order to assure cleanness and hydrophobicity of wafer surfaces while preparing semiconductor wafers for further processing.

With regard to the limitation in preamble, reciting "...cleaning...before the epitomical deposition step...", since Patruno et al. teach that before epitaxy being done a complete oxide removal and native oxide formation with SC1 solution is performed, however remain silent about the specificities of such processing, and Verhaverbeke et al. address such processing in details, one skilled in the art would have found it obvious to utilize the combined cleaning technique of Verhaverbeke et al. and Patruno for cleaning semiconductor wafers before the epitaxial deposition with the reasonable expectation of successes.

The combined teaching of Verhaverbeke et al. and Patruno et al. provides for further thermal processing at typical temperature of 400°C (reads on "baking", as provided in the instant claim 2).

The limitations of claims 7-9 are given the broadest interpretation due to the ambiguous character of these claims, as provided above. Patruno et al. on page 249 provide specific characteristics of DI water, which correspond to the limitations of the

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instant claims 7 and 8. While being silent about total dissolved silica content, the combined teaching of Verhaverbeke et al. and Patruno et al. indicates that the quality of DI water is key to extremely good results (Patruno et al., page 249, first paragraph). Therefore, one skilled in the art would have found it obvious to utilize the DI water of highest quality with the minimum trace content of silica.

18. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Verhaverbeke et al (US 2002/0102852) in view of Patruno et al (In-situ Rinse HF-Last for Pre-Epitaxy Cleaning, UCPSS, 1994, pp. 247-250) and in further view of Verhaverbeke et al (U.S. 6495,099).

The combined teaching of Verhaverbeke et al. and Patruno et al. does not specifically indicate the concentration of HF diluted solution, which is employed in the final cleaning step. US'099 teaches a method of cleaning a wafer, wherein the final processing with diluted solution of HF is utilized notwithstanding the various process cleaning fluids applied before. US'099 indicates that such solution may have a concentration greater than 1000:1 and more specifically 400:1 (water : HF). Therefore, one skilled in the art, motivated by the teaching of US'099 would have found it obvious to utilize the concentration of diluted HF solution as provided in US'099 in combined teaching of Verhaverbeke et al. and Patruno et al. with the reasonable expectation of success and thus to arrive at the limitation as instantly claimed.

19. Therefore, combination of references renders claims 1-9 prima facie obvious and properly rejected under 35 U.S.C. 103(a).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael Kornakov whose telephone number is (571) 272-1303. The examiner can normally be reached on 9:00am - 5:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Randy Gulakowski can be reached on (571) 272-1302. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

*M. Kornakov*  
*2/5/04*

Michael Kornakov  
Examiner  
Art Unit 1746